**Soil Trip Report—Addis Ababa to Blue Nile River Falls**

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**Overview**

It is highly unlikely that the area covered in this trip report (Addis Ababa to Debra Markos and on to Bahir Dar and the Blue Nile Falls) will be the area under investigation for this sustainable intensification project. However I would guess that some of the observations would be transferable to the soils and topography common in Ethiopia.

**Geology**

The soils around Addis Ababa formed from an old volcanic tuff and basalt; 2:1 clays are common on the ILRI site as evidenced by the common surface cracks. As you drive north you quickly come onto an old basalt plain parent material that often results in 2:1 expanding clays that continued for approximately 125 km. Soils exhumed by road cuts exhibited classic Vertisol properties including slickensides (suggesting textures in excess of 40% clay), deep A horizons due to self churning, and diffuse surface polygons at approximate 1-2 m spacing. Where these polygons were evident the land was only pastured; it is unclear if this gilgai topography would be evident if these soils were untilled in other areas. If these soils did not meet Vertisol criteria they would be classified as Mollisols (published soil data suggests that they will meet the base saturation criteria).

Erosion on the “black” soils was minimal, often a result of gully formation in the “red” soils upslope or road design flaws whereby water was channeled along the roadside on the upslope side until a culvert was installed that resulted in immediate gully formation that often quickly diffused downslope. Most gullies were not active on the black soils (little slumping or active erosion, revegetation common).

Cropping was intense on the black soils with good to excellent yields. Tillage was ongoing using an oxen-drawn wooden chisel plow. Surface residue cover after one pass was close to conservation compliance (30% crop residue cover that corresponds to an 80% reduction in erosion potential). The soils appear suitable for slot plant (zero till, no till) technology.

After approximately 125 km north of Addis the soils turned reddish as we entered the areas of alternating sandstone, shale, and limestone parent materials. In general, as soils become redder there is a corresponding increase in soil erosion rates. Most if not all red soil gullies were actively eroding. It was evident that many donors have worked in this area on erosion projects given the plethora of gabions, tree plantings in eroded areas, etc. USAID has had numerous projects in the past and present gauging from the degree of paint fading of the project signage.

The red soils continued most of the way to Bahir Dar and Lake Tana due to avoidance of the 2:1 clays (from the basalt flows) and the difficulties constructing and maintaining roads where expanding clays are common. From Bahir Dar to the Blue Nile Falls the road is on the basalt plain with black 2:1 expanding clay soils common. Therefore, this report is biased due to the fact that it followed the road! Based upon trip mileage, approximately 75% of the soils are red and 25% black (which is actually pretty close to published values for the country but is an artifact of road siting).

**“And” Trees!**

Tree number and diversity became more common as you travel north suggesting a distinct precipitation gradient/increase. Eucalyptus plantations, nurseries, and loading/processing areas are common about 100 km north of Addis. A priority should be to use the existing infrastructure to propagate local indigeonus species. The established value chain for eucalyptus could readily be used for indigeonus species.

**Economics/Yields**

Life is harder for peoples living on red soils based upon my own rudimentary metrics. These metrics include house construction and shoes[[1]](#footnote-1). Red soils yielded less on an areal basis, there is more cropping diversity due to the rainfall, and irrigation for vegetable production is common where there is surface water. Erosion is rampant on the red soils. Many adults were barefoot in the market and few children had shoes. Little design went into the houses, many in disrepair. Straw stacks smaller and less neat than in the black soil areas.

On the Black soils few were without shoes, houses followed simple designs that included some frills (paint, parapets, etc.). Hay and straw stacks were symmetrical and near perfect.[[2]](#footnote-2) The old adage that *‘rich soils make rich people and poor soils make poor people’* holds.

**Residues**

All residues and manures have value and are transported (straw, corn stalks, corn cobs) in all areas. Residues are placed on elevated platforms or trees as a storage mechanism to limit access by cattle and goats. Any conservation agriculture work will have to concentrate on minimum soil disturbance (slot plant) to maintain soil surface residue cover; cultural norms will not allow nonuse of crop residues by livestock.

**Livestock**

Transect elevation varied from 1146 m to 3080 m. Mix of livestock did not appear to change, numbers were excessive, high competition for grazing lands. More chickens needed and fewer ruminants!

**Observations—General**

* Although the area along this transect did not seem as poor as the rural areas of Lesotho (a non-FtT country) there are remnants of many donor projects (several USAID projects, World Vision, IFAD, Japan, etc.) and persons knowledgeable of these past and ongoing projects should be at the table so lessons are not relearned. Since this area has been chosen before for large projects, it could likely be chosen again due to the implied importance of relative ease of accessibility. Choosing this area again would be a mistake. This project needs to address impact in rural areas; accessibility should be a minor criterium.
* Relative wealth greater on black soils (all with shoes, better houses); productivity was stunning
* Black soils have high resilience, limited degradation to intensive tillage practices
* Red soils sensitive to tillage and disturbance, minimum tillage must be practiced if these soils are chosen for sustainable intensification
* In contrast to information presented at the workshop, there is no shift in livestock production based upon elevation gradients (1146 m at bottom of Blue Nile Gorge to 3080 m) and 600-km transect driven. Excess livestock numbers common throughout, both large and small ruminants

**Observations—RED SOILS**

* Relative wealth less on red soils (fewer shoes, housing)
* More diversity on red soils (irrigation, vegetables, fruits)
* Red soils more erodible than black soils on same slope and area
* It is possible that the red soils have a genetic B horizon that limits water movement which could be one of the reasons these soils are so highly erodible
* Yields are lower on red soils but fertilizer is routinely used due to low intrinsic soil fertility (personal bias and confirmed with open-ended question to two Ethiopian males; n=2, df=1).
* This project should target the red soil areas based upon this limited data
* Metrics for site selection that use irrigation as a measure of intensification will be biased toward red soils

**Observations—BLACK SOILS**

* Surface drainage works well on black soils; on red soils these small ditches can lead to gullies several meters wide and deep (the old adage holds that *‘what works on one soil does not always work on another’*)
* Black soils have high yields, many crops, all residues retained for livestock
* Rock mulch for water conservation common in drier areas of transect where sorghum grown
* Yields are high on black soils but little fertilizer used due to intrinsic soil fertility (personal bias and confirmed with open-ended question to two Ethiopian males; n=2, df=1).
* If black soils are part of project, work on fertilizer calibration and correlation could have a positive impact
* Metrics that include fertilizer use as a measure of intensification will be biased toward red soils

Pictures and simple activity/intensity diagrams can be inserted to support summary; omitted for email ease (and simple laziness).

1. As an old bricklayer, houses are judged on relative symmetry (plumb and square) and details such as paint and roofing; more details suggest more time available. Since it was market day areas were evaluated on prevalence of shoes for young and old once more that 100km outside Addis Ababa. [↑](#footnote-ref-1)
2. It is commonly agreed that as agriculture becomes more proficient there is more time that can be devoted to arts and jobs associated with providing visual satisfaction. There was clearly a very ordered and artistic manner to storing residues in black soil areas whereas in the poorer red soil areas this process was much more haphazard and less appealing to the eye. [↑](#footnote-ref-2)